

ALEKS Tutors Students In Learning To Succeed

University of California, Irvine (UC Irvine)



The groundbreaking intelligent tutoring system developed at the University of California, Irvine, equalizes educational opportunities because it knows exactly what the student knows and what the student is ready to learn.

“Alan,” a student at Hilltop Middle School in Chula Vista, Calif., knows firsthand that when it comes to learning, one size doesn’t fit all.

He was getting Ds and Fs on his seventh-grade report card when his father called Gary Oakland, a teacher at his school, saying he didn’t know how to help his son.

Over the past five years, Oakland has had great success with ALEKS (Assessment and LEarning in Knowledge Spaces), a groundbreaking technology developed at the University of California, Irvine (UCI) in the mid-1990s. The revolutionary artificial intelligence technology, now used by hundreds of thousands of students in more than 1,000 schools, was developed by Jean Claude Falmagne, Ph.D., chairman and founder of ALEKS and emeritus professor of cognitive science at the University of California, Irvine, along with and a team of researchers.

Oakland suggested Alan try working with ALEKS. Using his home computer, Alan started getting excited about learning. Pretty soon he finished 100 percent of the state’s standard Grade 7 math requirements. Oakland, who has trained all of the math teachers and math department heads in his school district on ALEKS, says, “Over this past summer, Alan, who is now in eighth grade, completed 85 percent of an algebra course all on his own without ever spending a day in an algebra class.”

ALEKS has revolutionized learning because it interacts with students at a highly individual level of readiness instead of teaching to the “fat part of the curve.” Subjects such as math, chemistry and accounting, have been traditionally taught in a linear method — in a start-to-finish sequence.

“But the reality is not everyone learns at the same pace, and not everyone can afford a tutor,” Oakland says. “You should be able to achieve success by teaching in a logical, sequential manner, but it doesn’t work that way. Everyone learns differently.”

“*Anyone who has worked with ALEKS knows it is all about outcomes. Students are taken on a fantastic voyage of learning, and in the process, ALEKS helps them achieve academic success, often for the first time in their lives.*”

ALEKS Unveiled

In 1993, Falmagne says researchers at UCI received a “lucky break.”

“We received a \$2.4 million grant from the National Science Foundation to develop the software that would become ALEKS,” he explains.

The technology is based on Knowledge Space Theory, a milestone in cognitive psychology and applied mathematics. Its origin goes back to the early 1980s when Falmagne, along with Dr. Jean-Paul Doignon of the Free University of Brussels in Belgium, and scientists at New York University and other universities, began to develop Knowledge Space Theory.

“Knowledge Space Theory is not only about finding out what someone knows, but that knowledge acquisition takes place in a ‘learning space,’” says Falmagne who notes the extremely complex software took 10 years and millions of lines of code to create.

In 1997, the UCI Office of Technology Alliances licensed the technology to ALEKS Corp. Two years later, McGraw-Hill became the distributor of ALEKS in higher education.

“In 1999, our first commercial products of Basic Math and Beginning Algebra for two-year colleges got off the ground,” notes Falmagne. “Our partnership with McGraw-Hill has also allowed us to develop many other products.”

Classroom Dynamics

From the moment the computer screen lights up, ALEKS takes students on a rewarding journey. The technology can be used for independent learning — students can get ahead on their own by accessing ALEKS from any computer or the software can be used for specific courses as well as in school computer labs.

In November 2006, Oakland made a presentation to the California Math Council showing how ALEKS can help students with varying scholastic aptitudes succeed beyond their wildest dreams.

Oakland's school, located about 15 miles from Mexico, has a student population that is about 75 percent Hispanic.

ALEKS is fully bilingual in Spanish and English for math through Grade 9, with instantaneous "one click" translation.

In 2001, when the school received a flyer about ALEKS, Oakland was teaching an after-school algebra recovery program to seventh- and eighth-grade students (to help them "recover" their grades from failing the class the year before).

"The students have to make up 60 hours to repeat or 'recover' a class," Oakland says. "Some of our students weren't even coming to school."

On top of failing grades, he says behavioral issues created a nightmare atmosphere for both students and teachers. But there was hope in the form of ALEKS.

"The more they use ALEKS, the more apt they are to get good grades," Oakland comments. "When they get their first 'A' it's a heady experience — there's no stopping them."

"First off, ALEKS does an assessment to determine precisely which topics the student has already mastered," says R.G. Wilmot Lampros, president of ALEKS Corp., Tustin, Calif. "ALEKS avoids multiple choice questions. There are no lucky guesses — it's not geared to finding out how good a test taker a person is. The student has to know how to solve a problem."

Oakland's school didn't have a computer lab, but he was determined to build one so his students could use ALEKS. Oakland, along with an information technology staffer from the school, brought in 60 old computers that didn't work.

"Together we repaired and rebuilt the computers, bought inexpensive keyboards, and repaired tables and chairs," he recalls. "In the end we had our computer lab complete with 34 computers."

Oakland saw positive results from ALEKS from the start. He willingly made the long drive from the mountains where he lives to teach the algebra recovery classes on weekends and during the summer in addition to after school classes, which are now math support classes.

Lampros notes that ALEKS was not developed around the idea of using technology to maximize high-end graphics.

"That's one of the reasons why ALEKS' success is so fascinating," he says. "We use graphics where they are pedagogically useful. Students fall in love with ALEKS not because of its visuals, but because using it enables them to learn and excel." They also see an immediate assessment of what they know and how to do a problem right.

"They tell me they love 'seeing' what they know," says Oakland, referring to the program's popular pie chart feature. "When students click on it, ALEKS shows them not only what they can do but, what they are ready to do next. They love seeing where their knowledge is growing."

Learning Comes Alive

Harold Baker, Ph.D., director of customer support, has been with ALEKS since before it became a commercial product. From early on, he recalls a vivid image of how ALEKS makes math come alive.

"A student with developmental disabilities was sitting at her computer at a community college unable to type like other students, but she was so caught up in learning math from ALEKS, that she used her pencil's eraser to enter numbers and letters from her keyboard," he says.

What ALEKS is not, he says, is a program that just gives more homework online.

“There are possibilities for deep customization with ALEKS — it has many features to make sure teachers are successful as well as students,” he says.

“Studies have shown that early failure in math, particularly in Algebra 1 and 2 is often a predictor of failures in other disciplines,” says Baker. “If a student has failed before, he will likely fail again. ALEKS breaks the cycle of repeated failure.”

ALEKS offers another classroom benefit. It frees up teacher time and allows teachers to spend more time with individual students (or small groups) and do more creative things. “Instead of just teaching math and other subjects, teachers can have fun teaching students the applications of math such as how math is used in building bridges,” notes Baker.

What’s next for ALEKS? The company will launch an elementary chemistry program in early 2007. Recently, a study by researchers at the University of Memphis, showing how an ALEKS statistics program can eliminate racial disparities, was accepted by the American Educational Research Association for presentation at its annual meeting.

Summing up why students like ALEKS, Falmagne says, “It talks directly to them, and it always rewards their time and effort.”

While ALEKS has made a difference in many students’ lives, more will benefit in the future. “The potential for success for students throughout the world is unlimited,” says Baker. “ALEKS is an intelligent tutoring system that really works.”

This story was originally published in 2007.

To see available technologies from research institutions, [click here](#) to visit the AUTM Innovation Marketplace.

Share your story at autm.net/betterworldproject

[#betterworldproject](https://twitter.com/betterworldproject)